

Description

The 842AR-P *Silver Conductive Pen* easily draws and repair conductive traces. It dispenses a conductive paint made of durable acrylic lacquer that is pigmented with extremely conductive silver flakes. The cured traces are durable and corrosion resistant.

This pen works best on smooth, flat, hard surfaces. The valve-tip opens when pressed against the drawing surface, and the flow is controlled by squeezing the barrel.

Applications & Usages

Use this pen for drawing or repairing extremely conductive traces.

It is used for repairing damaged traces on keyboards, game controllers, remote controls, mixing boards, or PCB's.

Also, it is used to create conductive traces on a variety of surfaces for prototyping, hobbies, or maker projects. It is good for making small connections in or between circuits, such as jumpers, through-holes, bridges, and links. It can also be used to increase the surface area of contacts by painting the area around them.

Benefits and Features

- **Volume resistivity: 0.0001 Ω ·cm**
- **Creates durable, reliable, and highly conductive connections**
- **Typical trace width: 0.9 mm**
- **Dries in minutes at room temperature**
- **Adheres to plastics, epoxy, copper, aluminum, ceramics, wood, and most electronic substrates**
- **Adheres to ABS, PLA, and other 3D printed plastics**
- **Superior corrosion resistance**
- **Mild solvent system**
- **Toluene, xylene, and MEK free**

ENVIRONMENT

RoHS Compliant
Low-VOC

ATTENTION! Shake rigorously before use. For best results hold pen at angle, depress pen tip against surface, and draw pen across surface while gently squeezing middle.

Usage Parameters

<i>Properties</i>	<i>Value</i>
Handling Time	10 min
Drying Time @25 °C [77 °F]	24 h
Drying Time @65 °C [149 °F]	30 min
Shelf Life	2 y
Typical Trace Width	0.9 mm
Theoretical Pen Coverage ^{a)}	≤450 cm ² ≤70 in ²

a) Idealized estimate based on a coat thickness of 25 µm [1.0 mil] and 100% transfer efficiency

Temperature Ranges

<i>Properties</i>	<i>Value</i>
Constant Service Temperature	-40 to 120 °C [-40 to 248 °F]
Intermittent Temperature Limit	-50 to 125 °C [-58 to 257 °F]
Storage Temperature Limits ^{b)}	-5 to 40 °C [23 to 104 °F]

b) The product must stay within the storage temperature limits stated.

Principal Components

Name	CAS Number
Silver	7440-22-4
Acrylic Resin	25608-33-7
Acetone	67-64-1
Dimethyl carbonate	616-38-6
Heptan-2-one	110-43-0

Properties of Cured 842AR-P ^{a)}

<i>Electric & Magnetic Properties</i>	<i>Method</i>	<i>Value</i>
Volume Resistivity	Method 5011.5 in MIL-STD-883H	0.0001 Ω·cm 9337 S/cm
Surface Resistance ^{a)}		<i>Resistance</i> <i>Conductance</i>
1 coat	Square probe	<0.01 Ω/sq ^{b)} >100 S
2 coats	Square probe	<0.01 Ω/sq ^{b)} >100 S
3 coats	Square probe	<0.01 Ω/sq ^{b)} >100 S
Magnetic Class		Diamagnetic (Non-magnetic)
Relative Permeability		<1.0
<i>Physical Properties</i>	<i>Method</i>	<i>Value</i>
Paint Type	—	Lacquer (Thermoplastic)
Color	Visual	Metallic Silver Grey
Abrasion Resistant	—	Yes
Blister Resistant	—	Yes
Peeling Resistant	—	Yes
Water Resistant	—	Yes



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Silver Conductive Pen 842AR-P Technical Data Sheet

842AR-Pen

<i>Mechanical Properties</i>	<i>Method</i>	<i>Value</i>
Adhesion ^{c)}	ASTM D3359	5B
Pencil Hardness ^{c)}	ASTM D3363	3H, hard

- a) Values based on liquid format. Pen format values may vary slightly.
- b) Readings less than 0.01 Ω/sq are below the detection limit of the handheld multimeter and square probe method.
- c) Tested using HVLP spray gun application on acrylonitrile butadiene styrene (ABS) coupons

Properties of Uncured 842AR-P

<i>Physical Property</i>	<i>Mixture</i>
Color	Metallic Silver
Density @25 °C [77 °F]	1.7 g/mL
Solids Percentage (wt/wt)	61%
Viscosity @25 °C [77 °F] ^{a)}	873 cP [503 mm ² /s]
Flash Point	-17 °C [1.4 °F]
Odor	Acetone-like

- a) Brookfield viscometer at 30 RPM with spindle LV S62

Compatibility

Chemical—The silver filler is quite resistant to oxidation, except in environments that contain contaminants like H₂S or ozone which tarnish its surface. Unlike many other metal oxides, silver oxide remains conductive so degradation due to oxidation is not as bad.

The thermoplastic resin is dissolved by common paint solvents like toluene, xylene, acetone, and MEK. This allows great coating repair and work characteristics, but it does make the coating unsuitable for solvent rich environments.

Adhesion—The 842AR-P coating adheres to most plastics used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present, clean the surface to be coated first.



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842AR-Pen

842AR-P Adherence Compatibility

Substrate	Note
Acrylonitrile Butadiene Styrene (ABS)	Chemically etches ^{a)} and adheres well to this substrate.
Polybutylene Terephthalate (PBT)	"
Polycarbonate	"
Polyvinyl Acetate (PVA)	"
Polyvinyl Chloride (PVC)	"
Acrylics or Acrylic Paints	Adheres well to clean surface
Copper, Lead, Tin	"
Epoxy, FR4 substrate	"
Polyurethane	Adheres well to clean surface for most urethane types
Wood	Adheres well with surface preparation

a) Etching is similar to sanding, except that it also softens the surface helping to meld the paint to the plastic for superior adhesion.

ATTENTION! Do not use on thin plastics or on plastics where you want to keep original surface intact. The 842AR-P contains a controlled amount of solvents designed to chemically etch plastic surfaces to help adhesion by melding the acrylic coating into the plastic substrate. This prevents flaking or peeling. Using the 4351-1L thinner lessens the etching effects for chemically sensitive substrates.

Storage

Store between -5 and 40 °C [23 and 104 °F] in dry area. Store pen with the tip up after use.

Health, Safety, and Environmental Awareness

Please see the 842AR-P **Safety Data Sheet** (SDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The VOC (Volatile Organic Compound) content is 12% (200 g/L) by EPA and WHMIS standards.

This product meets the European Directive 2011/65/EU Annex II (ROHS); recasting 2002/95/EC.

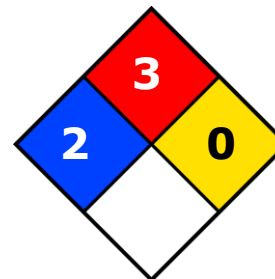
Health and Safety: The solvents in 842AR-P can ignite if exposed to flames or sparks and can cause respiratory track irritation. If ignited, then flame flash back is possible. Use in well-ventilated area.

Solvents can cause skin irritation and have some reproductive effects. Wear safety glasses or goggles and disposable gloves to avoid exposures.

HMIS® RATING

HEALTH:	* 2
FLAMMABILITY:	3
PHYSICAL HAZARD:	0
PERSONAL PROTECTION:	

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:

0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Pen Application Instructions

Follow the procedure below for best results.

To apply the liquid pen

1. Ensure that the surface to be coated is clean and oil-free.
2. Shake pen vigorously until the ball moves freely inside
3. Hold pen at angle and depress tip against surface
4. Draw pen across surface while gently squeezing barrel
5. Let dry 10 minutes before handling
6. For optimal conductivity, let stand 24 hours or heat cure at 65 °C for 30 minutes
7. Replace cap and store tip up after use

To cure at Room temperature

- Let air dry 24 hours

To accelerate cure by heat

- After flash off, put in oven or under heat lamp at 65 °C for 30 min.

NOTE: Coats that are very thick require more time to dry.

ATTENTION! If heat curing, do not exceed 65 °C as this may cause surface defects due to solvents evaporating off too quickly.



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842AR-Pen

Packaging and Supporting Products

<i>Cat. No.</i>	<i>Packaging</i>	<i>Net Volume</i>		<i>Net Weight</i>		<i>Packaging Weight</i>	
842AR-P	Pen	5.0 mL	0.16 fl oz	8.69 g	0.3 oz	0.03 kg	0.07 lb
842AR-15ML	Jar	12 mL	0.4 fl oz	20.8 g	0.73 oz	0.08 kg	0.17 lb
842AR-150ML	Can	150 mL	5.0 fl oz	260 g	9.19 oz	0.31 kg	0.69 lb
842AR-900ML	Can	850 mL	1.79 pt	1.47 kg	3.25 lb	1.82 kg	4.01 lb
842AR-3.78L	Can	3.60 L	3.8 qt	6.26 kg	13.7 lb	6.80 kg	15.0 lb
842AR-140G	Aerosol	110 mL	3.7 fl oz	140 g	4.9 oz	TBD	TBD
842AR-340G	Aerosol	268 mL	9.0 fl oz	340 g	12 oz	"	"

Note: TBD = To Be Determined

Thinners & Conductive Coating Removers

- *Thinner*: Cat. No. 435-1L, 435-4L
- *Thinner 1*: Cat. No. 4351-1L, 4351-4L

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

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Warranty

M.G. Chemicals Ltd. warrants this product for 12 months from the date of purchase by the end user. *M.G. Chemicals Ltd.* makes no claims as to shelf life of this product for the warranty. The liability of *M.G. Chemicals Ltd.* whether based on its warranty, contracts, or otherwise shall in no case include incidental or consequential damage.

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